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ABSTRACT

This study replicates and elaborates a three-dimensional, spherical model that integrates research findings concerning social and emotional behavior, psychopathology, and academic competence. Kindergarten teachers completed an extensive set of rating scales on 100 children, including the Classroom Behavior Inventory and the Child Adaptive Behavior Inventory. Factor analysis of these behavior rating scales replicated the major dimensions of academic competence, considerateness versus hostility, and extraversion versus introversion. Multidimensional scaling analysis revealed a spatial configuration or map of the interrelationships of the various behavior scales. Scales that had been developed to measure apathy and asocial behavior contributed to a more detailed description of sectors in the model. Sectors of the unified model that integrate domains of cognition, conation, and affect corresponded with the major diagnostic categories of the "Diagnostic and Statistical Manual of Mental Disorder" (3rd ed.) and with dimensions of child behavior identified in other studies. Thus, it is suggested that the unified spherical model may contribute to more comprehensive studies of child behavior and to the integration of research findings within and across studies. (Author/RH)

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Spherical Model Integrating Academic Competence With Social Adjustment and Psychopathology

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ABSTRACT

Extensive development of concepts and measures and accumulation of research findings on child behavior suggest the need for integration through replicable dimensions and models. Two-dimensional and circumplex models have been developed for social and emotional behavior, for emotions and psychopathology, and for interpersonal behavior. This study was designed to replicate and elaborate a three-dimensional, spherical model that integrates social and emotional behavior, psychopathology, and academic competence.

Kindergarten teachers completed an extensive set of rating scales including the Classroom Behavior Inventory (CBI) and the Child Adaptive Behavior Inventory (CABI) on 100 children. Factor analysis of these behavior rating scales replicated the major dimensions of Academic Competence, Considerateness vs. Hostility, and Extraversion vs. Introversion. Multidimensional scaling analysis revealed a spatial configuration or map of the interrelationships of the various behavior scales. Scales that had been developed to measure Apathy and Asocial Behavior contributed to a more detailed description of sectors in the model.

The unified model not only replicates, but differentiates the major dimensions of child behavior. Sectors of the unified model that integrate domains of cognition, conation, and affect correspond with the major diagnostic categories of DSM III and with dimensions of child behavior identified in other studies. Thus the unified spherical model may contribute to more comprehensive studies of child behavior and to the integration of research findings within and across studies.

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Spherical Model Integrating Academic Competence with Social Adjustment and Psychopathology

Extensive development of concepts and measures and accumulation of research findings on child behavior suggest the need for integration of measures and findings through replicable dimensions and models. Similar two-dimensional circumplex models have been developed for child social and emotional behavior (Baumrind & Black, 1977; Becker & Krug, 1964; Schaefer, 1961; Schaefer & Bayley, 1963), for emotions (Plutchik, 1980; Russell, 1980), and for adult interpersonal behavior and psychopathology (Wiggins, 1980, 1982). Reviews of research on child psychopathology (Achenbach & Edelbrock, 1978) and on child behavior (Schaefer, 1971) have also noted convergence of factor analytic studies upon two major dimensions for the domain of social and emotional behavior. However, studies that have also included concepts for the domain of task-oriented behavior and academic competence as well as social and emotional behavior have begun to identify additional dimensions of child psychopathology (Achenbach & Edelbrock, 1978) and adaptive behavior (Baumrind, 1982; Schaefer, 1971, 1981; Schaefer & Edgerton, 1982). Multidimensional scaling analyses of psychological traits and child behavior have differentiated a dimension of academic competence from dimensions of social adjustment (Rosenberg, Nelson, & Vivekananthan, 1968; Schaefer, Edgerton, & Hunter, 1983). Evidence that maladaptive,

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psychopathological behavior is highly negatively correlated with adaptive, prosocial, competent behavior suggests the feasibility of developing a unified model for academic competence, social adjustment and psychopathology. (Kohn 1977; Schaefer, 1981).

The extension of a two-dimensional circumplex model for social and emotional behavior into a three-dimensional model for adjustment and competence was initially developed from scales of the Classroom Behavior Inventory that included ratings of extraversion, introversion, considerateness, hostility, verbal intelligence, curiosity/creativity, and task-orientation (Schaefer, 1981; Schaefer & Edgerton, 1982). The three-dimensional integration of scales for competence, social adjustment, and psychopathology was replicated (Schaefer, Edgerton, & Hunter, 1983) with a more extensive set of measures that included the Classroom Behavior Inventory scales, an adaptation and extension of Bipolar Trait Rating Scales (Becker & Krug, 1964), and a version of Conners' Teacher Rating Scales (Goyette, Conners, & Ulrich, 1978). A multidimensional scaling analysis, as well as factor analysis, supported a three-dimensional unified model for academic competence and social adjustment.

A goal of replicating and extending the earlier three-dimensional configurational model for teacher ratings of child behavior with a more heterogeneous sample of children

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and with an extended set of measures motivated this analysis. It was hypothesized that new scales for Asocial Behavior and Apathy would contribute to a more detailed description of sectors of the unified model. Specifically, it was anticipated that Asocial Behavior would describe the region adjacent to Introversion and Depression, and that Apathy would describe the region bounded by Introversion, Low Curiosity/Creativity, and Low Verbal Intelligence. Further motivation for the development of the Apathy scale was a hypothesis that Apathy might contribute to the definition of a syndrome of attention-deficit disorder without hyperactivity, i.e., a more introverted type of inattention.

Method:

Subjects: The 100 subjects were recruited for a study of the adaptation of low birth weight children at home and school during the kindergarten year. Birthweights of the 51 girls and 49 boys in the sample ranged from 794 grams to 2500 grams with a mean of 2002 grams. Nine children were reported to be handicapped with cerebral palsy, mental retardation, autism, Down's syndrome, or Turner's syndrome. Education of the 55 black and 45 white mothers varied from 4 to 19 years with a mean of 12 years. Fifty-five of the mothers were employed. The mothers' ages ranged from 20 to

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43 years, with a mean age of 31 years. Fifty-four mothers were married, 26 divorced or separated, 19 single, and 1 widowed.

Measures. Teachers rated the children during the spring of their kindergarten year using several inventories including the two reported here: The Classroom Behavior Inventory (CBI), and the Child Adaptive Behavior Inventory (CABI).

The Classroom Behavior Inventory was initially developed to measure major dimensions of social and emotional behavior including Considerateness versus Hostility and Extraversion versus Introversion (Schaefer, 1961). Subsequent studies developed scales that describe components of academic competence including Task-Orientation versus Distractibility (Schaefer, 1971), Verbal Intelligence, Curiosity/Creativity, and Independence (Schaefer & Edgerton, 1982; Schaefer, Edgerton, & Hunter, 1983). The CBI scales have shown substantial reliability and validity in several studies of normal and clinical samples. Validity of the Verbal Intelligence scale is supported by substantial correlations with mental test scores (Schaefer, 1981). Learning-disabled children are consistently rated low on Task-Orientation, emotionally handicapped children are rated high on Hostility, and educable mentally retarded children are rated

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low on Verbal Intelligence (McKinney & Forman, 1982). Kohn (1977) has demonstrated correlations between CBI scales and other data on social adjustment and academic competence.

The Child Adaptive Behavior Inventory was initially developed to collect mothers' ratings of their children. Evidence of high reliability and validity motivated the development of a teacher version (CABI-T) for this study. The CABI-T collects teacher's perceptions of the child's strengths and skills as well as problems and symptoms, with scales that describe academic competence as well as social adjustment. The CABI-T includes several scales that are similar to CBI scales in content, as well as scales for concepts of hyperactivity, apathy, asocial behavior, depression, and anti-social behavior. Behavior descriptions from other methods, including Conners (1969) and Achenbach and Edelbrock (1978), contributed to development of the maladaptive behavior scales.

Data analyses: Internal consistency reliabilities of teacher ratings scales were computed with Cronbach's alpha. Scale intercorrelations were factor analyzed with principal factor analysis and varimax rotation. Multidimensional scaling analysis was completed, after inverting the maladaptive behavior scales, with ALSCAL procedure (Young, Takane & Lewyckyj, 1980) utilizing intercorrelations of scales and factor scores as the basis for estimating

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proximities of measures. The plot of the multidimensional scaling analysis, after inversion of maladaptive scores, reveals similarity of the absence of maladaptive behavior to the presence of adaptive behaviors.

Results:

The internal consistency reliabilities, calculated with Cronbach's alpha, ranged from .80 to .96 for the 3- to 8-item scales. Reliabilities of the new 5-item scales--.90 for Asocial and .84 for Apathy--are relatively high for a priori scales. The high reliabilities for the adaptive behavior scales as well as the maladaptive behavior scales suggest that teachers can give reliable ratings for adjustment and competence.

Factor analysis of scale intercorrelations replicated the factor structure that was identified in earlier studies (Table 1). The first factor had substantial loadings for adaptive behaviors of Considerateness and Altruism and maladaptive behaviors of Hostility and Antisocial Behavior. Hyperactivity, Distractibility, Task-orientation, and Independence had substantial loadings on the first factor as well as on the second factor which describes Academic Competence. Verbal Intelligence, Curiosity/Creativity, and Academic Competence had high loadings on the second factor. The third factor included substantial loadings for

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Introversion, Depression, and Asocial Behavior. Apathy had a high loading on the factor Extraversion/Introversion, a significant loading on the Academic Competence factor, and a lower loading on the first factor of Considerateness vs. Hostility, all in the negative direction. The mean communality of .81 computed from the sum of the squared factor loadings is very similar to the mean of the squared scale reliabilities of .79, both of which are high proportions of total scale variance. Thus only two factors of social-emotional behavior and a factor of academic competence are required to integrate these teacher ratings of child behavior.

In order to facilitate integration of the factor analysis with the multidimensional scaling analysis, maladaptive behavior scores were inverted, factor scores were computed, and the three factors were correlated with the scale scores. The MDS analysis was based on the intercorrelations of factors and scales. The MDS analysis that is plotted in Figure 1 yielded a low Kruskal stress of .06 (Kruskal & Wish, 1978). Since variations in distance between scales reveal variations in intercorrelations, plots for orthogonal factors are located on the periphery of the figure whereas typically higher correlations between scales are revealed by varying distances between concepts. Thus conceptual similarity or equivalence is revealed by

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proximity of highly intercorrelated concepts/measures whereas differentiation and independence are revealed by varying distances between concepts. The plot of the MDS provides a visual presentation of the nomological network among measures that has been interpreted as contributing to construct validity (Cronbach & Meehl, 1955). Bipolarity of related concepts is revealed by proximity of adaptive and inverted maladaptative behavior concepts (Figure 1), by similarity of factor loadings (Table 1), and by scale intercorrelations (Table 2). The geometric presentation of the relationships between concepts derived from multidimensional scaling analysis complements the algebraic presentation derived from factor analysis by facilitating perception of a gestalt, a unified conceptual model for the domain of academic competence and social adjustment.

Discussion:

Two major dimensions of social-emotional behavior of Love versus Hostility and Extraversion versus Introversion that have repeatedly been identified in earlier research were replicated for this sample. (Schaefer, 1961, 1971). A dimension of academic competence that complements the two dimensions of social adjustment (Schaefer, 1981; Baumrind, 1982) is also clearly identified in this analysis. The replicated configurational model developed from

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multidimensional scaling extends a two-dimensional circumplex model for social and emotional behavior into a unified spherical model for social adjustment and academic competence (Schaefer, Edgerton, & Hunter, 1983).

Bipolarity of concepts, i.e., the high negative correlations that were observed between measures of adaptive behavior and maladaptive behavior, also replicates findings of earlier researches that have investigated both positive and negative behavior (Kohn, 1977; Schaefer, 1981). The bipolarity of personality measures supports the identification of major dimensions of child psychopathology that have been explored in the fields of abnormal child psychology and child psychiatry (Achenbach & Edelbrock, 1978; Quay, in press; Rutter, 1967) with sectors of the model. Although many clinical studies have focussed primarily or exclusively upon measures of deviant, deficient, and pathological behavior, measures for adaptive behavior that have high reliability describe each sector of the spherical model. Future studies of child behavior might emphasize development and/or utilization of measures of adaptive, competent, and prosocial behavior to complement the current emphasis on measurement of pathology. An emphasis on description of adaptive behavior might encourage a focus on development, identification, and reinforcement of adaptive behavior to complement a focus upon screening,

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diagnosis, and treatment of pathology. Identification of specific positive goals for specific children might encourage parent and teacher attention to adaptive behavior, a focus that has been effective in reducing frequency of maladaptive behavior (Baer, Rowbury, Baer, Herbert, Clark, & Nelson, 1976).

The replicated dimensions, clusters, and configurations that were identified in this analysis suggest the feasibility of integrating adaptive and maladaptive behavior concepts with other conceptual schemes and with the diagnostic categories of DSM III (American Psychiatric Association, 1980). The domains of affect/social-emotional behavior, conation/motivation, and cognition/intelligence that have been investigated in different research fields, by different investigators, and with different methods can be identified with sectors of the unified model for child behavior as illustrated by Table 3. The model identifies two bipolar dimensions of social-emotional behavior that have been isolated in factor analytic studies in developmental psychology, educational psychology, abnormal child psychology, and child psychiatry. The model also identifies two differentiated patterns of conation/ motivation that are both correlated with a dimension of academic competence, yet are correlated with different dimnsions of social-emotional behavior. The sector of

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task-orientation and independence versus hyperactivity and distractibility has been described in DSM III as Attention Deficit Disorder with Hyperactivity while the sector of curiosity/creativity versus apathy might be related to the less frequent diagnosis of Attention Deficit Disorder Without Hyperactivity. That identification is supported by Quay's (in press) observation that an attention problem syndrome has frequently emerged from factor analytic studies of child psychopathology but that motor underactivity appears in the syndrome more frequently than overactivity. Perhaps children with attention deficit with apathy are less frequently referred for clinical services than children with hyperactivity, which is more correlated with antisocial behavior.

McKinney and Forman's (1982) analysis of teacher ratings supports an identification of the educational psychology categories of learning disability, educational handicap, and emotional handicap with sectors of the unified model. The unified spherical model for social adjustment and academic competence might integrate other concepts and measures from the fields of child psychology and child psychiatry. Similarity of circumplex models in personality research on adults and children also suggests that the spherical model might be useful in integrating research on adult personality and on interpersonal perception. The model contributes to

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differentiation and integration of numerous concepts for prosocial behavior, social competence, adaptive and maladaptive behavior, and psychopathology that have been identified in research reviews (Achenbach & Edelbrock, 1978; Anderson & Messick, 1974; Garmezy, Masten, Nordstrom, & Ferrarese, 1979; Schaefer, 1981; White, 1959; Zigler & Trickett, 1978).

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Figure I

CONFIGURATION OBTAINED FROM A MULTIDIMENSIONAL SCALING ANALYSIS OF CHILD BEHAVIOR SCALES AND FACTORS

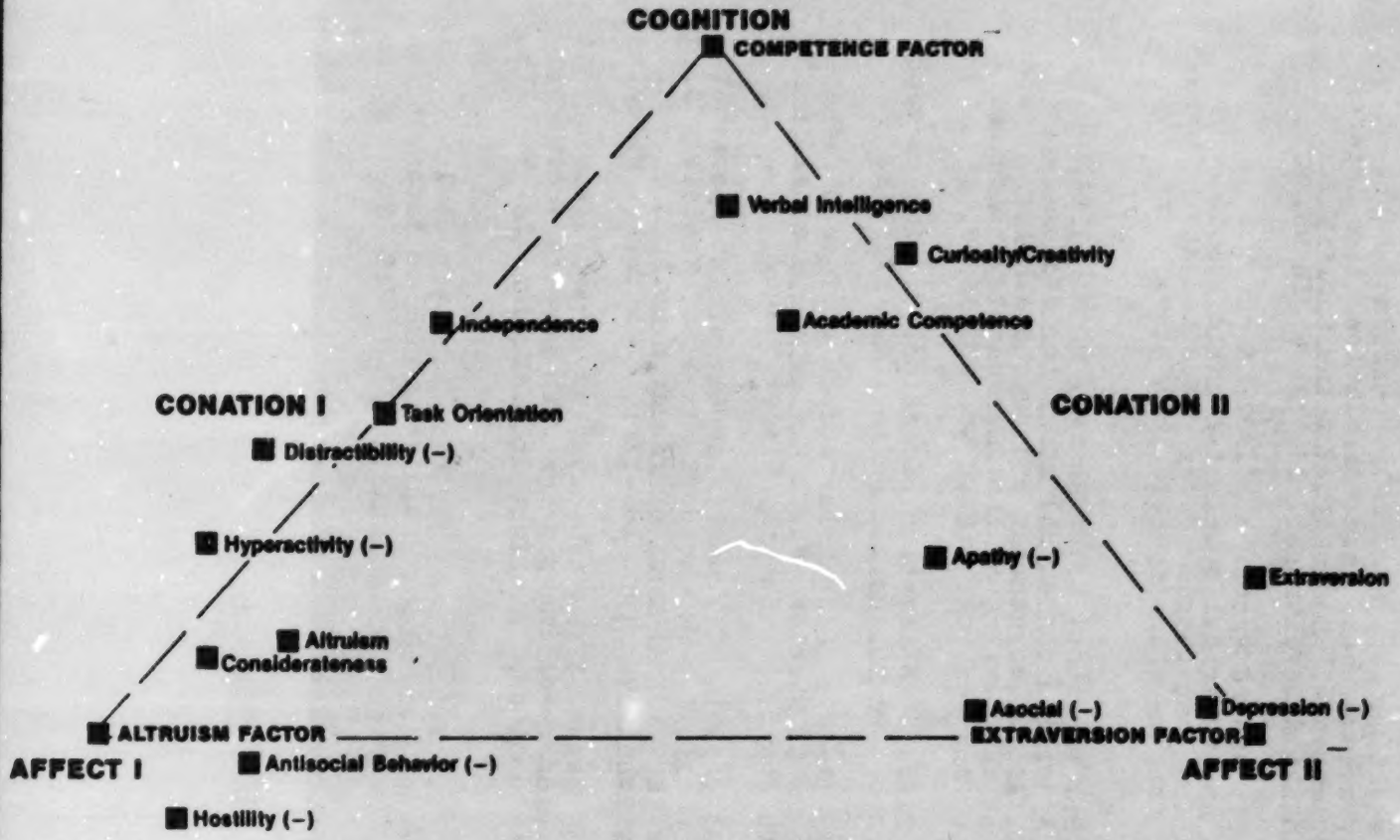

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Table 1

Factor Structure of Classroom Behavior Inventory (CBI) and Child Adaptive Behavior Inventory (CABI) Scales (N = 100)

Scale	Method	I	II	III
Hostility	CBI	-81	00	-13
Antisocial Behavior	CABI	-86	-06	-22
Considerateness	CBI	86	23	13
Altruism	CABI	86	27	21
Hyperactivity	CABI	-89	-34	04
Distractibility	CBI	-77	-47	06
Task Orientation	CBI	69	61	16
Independence	CBI	55	65	15
Academic Competence	CABI	28	81	45
Verbal Intelligence	CBI	21	84	29
Curiosity/Creativity	CBI	11	78	46
Apathy	CABI	-37	-43	-70
Asocial Behavior	CABI	-36	-24	-79
Extraversion/Introversion	CABI	06	29	85
Depression	CABI	-10	-14	-80

Factor I: Considerateness vs. Hostility
Factor II: Academic Competence
Factor III: Extraversion vs. Introversion

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Table 2

Correlation Matrix of CBI and CABI Scales in Approximate Order of Neighboring (N = 100)

	Scales	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Hostility*	-														
2	Antisocial Behavior	81	-													
3	Considerateness	73	77	-												
4	Altruism	71	78	92	-											
5	Hyperactivity*	70	78	81	85	-										
6	Distractibility*	63	66	76	79	89	-									
7	Task-Orientation	53	64	74	79	86	85	-								
8	Independence	38	56	62	66	74	73	88	-							
9	Academic Competence	32	39	49	56	52	59	76	74	-						
10	Verbal Intelligence	26	32	41	45	48	59	66	68	88	-					
11	Curiosity/Creativity	17	28	36	44	36	45	57	60	89	88	-				
12	Apathy*	38	51	46	55	52	56	65	61	76	63	69	-			
13	Asocial Behavior*	36	49	46	54	44	45	56	47	65	47	59	82	-		
14	Extraversion/Introversion	07	14	15	24	06	15	26	26	61	49	62	68	72	-	
15	Depression*	16	27	22	26	19	19	31	31	47	38	46	69	71	73	-

*All negative scales inverted for this analysis

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Table 3

DIFFERENTIATION OF MAJOR REGIONS OF THE UNIFIED MODEL AND INTEGRATION OF EQUIVALENT CONCEPTS FOR CHILD BEHAVIOR

Domain	ADAPTIVE BEHAVIOR	vs	MALADAPTIVE BEHAVIOR	DSM III DIAGNOSES	ACHENBACH & EDELBROCK (1978)	QUAY & PETERSON (1979)	SCHAEFER (1961)	BAUMRIND (1982)
AFFECT I	Considerateness	vs	Hostility	Conduct Disorder	Externalization	Conduct Disorder	Love vs Hostility	Social Responsibility
	Altruism	vs	Antisocial Behavior					
CONATION I	Task Orientation	vs	Hyperactivity	Attention Deficit Disorder with Hyperactivity		Motor Excess	Task Orientation vs Distractibility	Cognitive Competence
	Independence/ Perseverance	vs	Distractibility			Attention Problems/ Immaturity		
COGNITION	Academic Competence	vs	Academic Incompetence	Mental Retardation			Intelligence	
	Verbal Intelligence	vs	Low Verbal Intelligence					
CONATION II	Creativity/ Curiosity	vs	Apathy	Attention Deficit Disorder without Hyperactivity		Attention Problems/ Immaturity	Curiosity/ Creativity	
AFFECT II	Extraversion	vs	Introversion	Anxiety Disorder	Internalization	Anxiety-Withdrawal	Extraversion vs Introversion	Social Assertiveness
	Gregariousness	vs	Asocial Behavior					
	Cheerfulness	vs	Depression					

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